

**ENVIRONMENTAL IMPACTS ANALYSIS  
FOR THE PROPOSED  
MORROW ISLAND DISTRIBUTION SYSTEM  
FISH SCREEN INSTALLATION**

SUISUN MARSH, SOLANO COUNTY, CALIFORNIA

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**IMPACTS ANALYSIS**  
**MORROW ISLAND DISTRIBUTION SYSTEM FISH SCREEN INSTALLATION**  
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## 1.0 INTRODUCTION

This report is an addendum to the “Biological Assessment for the Proposed Morrow Island Distribution System Maintenance, March 1996”. Detailed descriptions of listed species’ status, range, distribution, habitat requirements, general ecology, population levels, and occurrence in the entire MIDS project area can be found in the original Biological Assessment. This report contains an assessment of potential impacts to listed species within the range of the fish screen installation activities. The report also discusses the potential impacts of the proposed activities on the species and their habitats..

The Department of Water Resources and the U.S. Bureau of Reclamation propose installation of seven conical fish screens on Morrow Island. On July 2, 1997 the U.S. Army Corps of Engineers issued a permit (No. 20698N) to perform maintenance on the Morrow Island Distribution System (MIDS). Permit conditions required installation of a fish screen on the Goodyear Slough diversion structure of the MIDS. Under consultation with the U.S. Fish and Wildlife Service and U.S. Army Corps of Engineers, DWR and USBR have developed a “Hybrid Proposal” for meeting the permit condition (Figure 1). The Hybrid Proposal consists of the following:

- ◆ Installation of 2 12-foot conical screens and 1-48 inch drain at the MIDS intake facility;
- ◆ Installation of 5 12-foot conical screens distributed along Goodyear and Suisun Sloughs;
- ◆ Addition of 1-36 inch turnout along C-line;
- ◆ Addition of 1-36 inch combination turnout and drain along M-line; and
- ◆ New Operations Agreement for the MIDS.

Actions to be conducted on the MIDS will be completed by DWR. These include all of the activities except the five distributed conical screens on Goodyear and Suisun Slough. The five conical screens will be placed on individual ownerships serviced by MIDS. Installation of these screens will be conducted by the Suisun Resource Conservation District (SRCD) under contract with the Department.

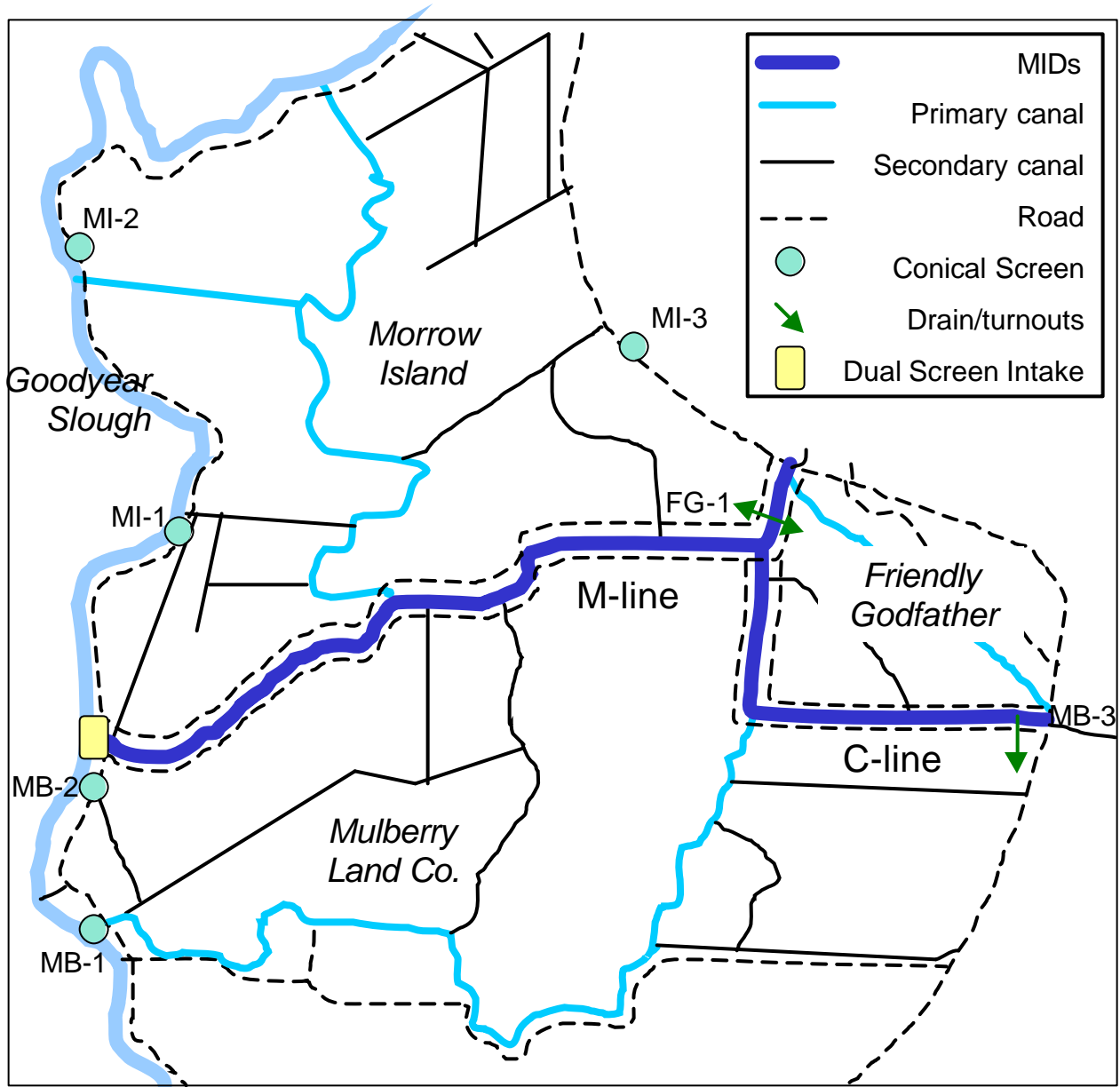


Figure 1 MIDS Hybrid Fish Screen Proposal

## 1.1 Project Scoping

The objective of the Hybrid Proposal is to prevent the entrainment losses of fish at the MIDS diversion on Goodyear Slough, while operating the MIDS at sufficient capacity to allow landowners to follow wetland management operation procedures recommended in the Individual Ownership Management Plan. Several fish screen alternatives were evaluated with respect to the following criteria: acceptability to landowner(s), environmental impact, permitting requirements, time requirement, managed wetlands operations/flexibility, water quality impacts, redeployment/salvage potential, reduction of system sedimentation, operations and maintenance requirements, consistency with SMPA Amendment 3, procurement requirement, and cost. The “Hybrid Proposal” was determined to be the preferred alternative, meeting the screening requirements of the USACE Permit, while providing operational flexibility to the managed wetlands and resulting in a less significant environmental impact than other alternatives. Section 5.0 Alternative Analysis contains a more detailed discussion of the project alternatives.

## 1.2 Scope of Environmental Impacts Analysis

This assessment evaluates the status of plant and animal species which are known or are suspected of potentially occurring in the mitigation areas. The specific objectives of this report are to provide accurate, up-to-date information on the ecology and occurrence of the pertinent species with special reference to the project area of the Morrow Island Distribution System in the southwestern Suisun Marsh, and to make assessments of the potential for impacts of the proposed project.

## 2.0 PROJECT AREA

Suisun Marsh is in southern Solano County, California, west of the Sacramento-San Joaquin Delta and north of Suisun Bay (Figure 2). This tidally influenced marsh is a vital wintering and nesting area for waterfowl of the Pacific Flyway, and it represents approximately 12 percent of California's remaining wetland habitat. The majority of the 52,000 acres of managed wetlands is privately owned and managed as waterfowl clubs by 153 different landowners.

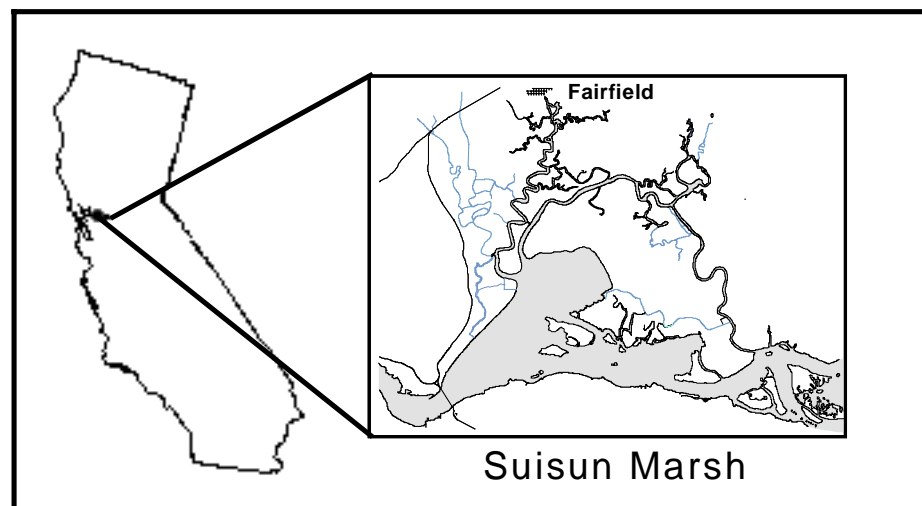


Figure 2. Location of Suisun Marsh

## 2.1 Morrow Island Distribution System

The MIDS consists of two hydraulically connected ditches, M-line and C-line, which extend from Goodyear Slough to lower Suisun Slough and Grizzly Bay (Figure 3). The system includes an intake structure on Goodyear Slough, and two outfall structures; one at the end of M-line (Suisun Slough) and one on the end of C-line (Grizzly Bay). The distribution system allows less saline water from Goodyear Slough to be conveyed using the tide (by gravity) as needed through flap-gated culvert pipes to managed wetlands on the eastern side of Morrow Island. Several turnouts along the distribution system are operated and maintained by the adjacent landowners. The M-line ditch is approximately 1.6 miles in length and the C-line ditch is approximately 0.8 miles in length.

Between 1997 and 1999 the Department conducted the following maintenance activities on the MIDS:

- ◆ Replaced the 36-inch diameter discharge pipe at the C-line outfall structure with (2) 36-inch diameter discharge pipes;
- ◆ Removed approximately 40,000 cubic yards of accumulated sediment along C-line and M-line ditches; and
- ◆ Raised the levees along the M-line and C-line ditches to their original design height, elevation 5.0 NGVD, and stabilized the southern and western levees along M-line and C-line.
- ◆ Widened the M-line levee road to the original design specification of 12-ft.

The currently proposed project is to fulfill mitigation requirements for these maintenance activities.

## 2.2 Individual Ownerships Along the MIDS

Three clubs are within the service area of the MIDS: Morrow Island Club (Ownership 702, 694 acres), Friendly Godfather Club (Ownership 703, 139 acres), and Mulberry Land Co (Ownership 705, 595 acres) (Figure 3).

## 3.0 PROJECT DESCRIPTION FOR DWR ACTIVITIES ON THE MIDS

DWR proposes to conduct the following activities on the MIDS:

- ◆ Replace three 48-inch combination intake/drains along Goodyear Slough with 2 12-foot conical screens (with 30 to 36-inch culverts) and 1 48-inch drain.
- ◆ Install two new 36-inch turnouts along the MIDS.

Construction is anticipated to begin May 1, 2001 and be completed by October 1, 2001.

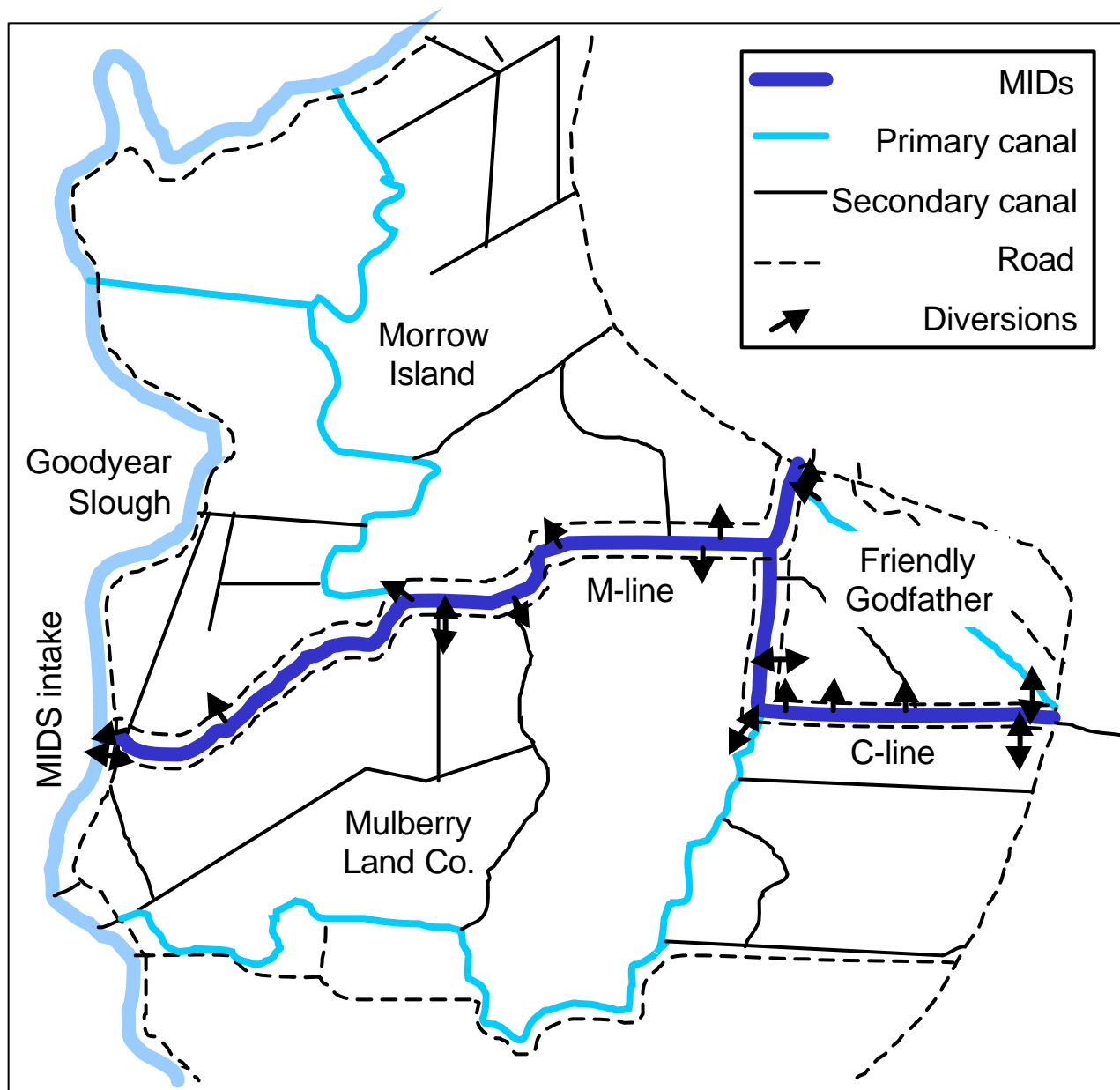


Figure 3 Existing Morrow Island Distribution System

### 3.1 Fish Screens

DWR will install two 12-foot conical screens on the intake structure to MIDS (Figure 4). Currently, three 48-inch diameter culverts are used to divert water from Goodyear Slough into the distribution system (Figure 5). Each culvert functions as a floodgate and is equipped with manually operated slide type control valves. The culvert intakes are presently unscreened allowing fish to enter the MIDS through the diversion culverts. Diversions from Goodyear Slough presently occur from October through May for flooding managed wetlands and pond water circulation.

#### 3.1.1 Fish Screen Design Criteria

The fish screens will consist of 12-foot diameter conical screens. This screen design has proven to be highly effective in Suisun Marsh. Thirteen conical screens are currently in use throughout the Marsh. The fish screen unit will consist of two conical intake screens with antifouling screen materials connected to a steel bifurcation manifold (Figure 6). Through tidal action, filtered water would flow through the screens, and through the 36-inch diameter culverts, into the distribution system. The screens meet the following design criteria:

- ◆ The screens are rated at 25 cfs each with a maximum approach velocity less than 0.2 fps.
- ◆ The screen material would be anti-fouling, corrosion resistant copper-nickel alloy with a maximum slot opening of 3/32-inch for rectangular wedge wire or 5/32-inch for perforated or woven mesh materials.
- ◆ Screens prevent entrainment of all fish larger than 1-inch in length, including: juvenile salmonids, striped bass, and delta smelt.

Each fish screen structure includes the following:

- ◆ One 12-foot diameter conical fish screen with submersible brush motor and controller.
- ◆ One 12-foot diameter by 3.5 feet deep fiberglass intake/screen support tank.
- ◆ One pressure-treated timber pile foundation, epoxy coated, with fabricated platform and pile cap support.
- ◆ One 30- to 36-inch diameter, six-foot long polyethylene intake pipe manifold with motor operated slide gate and flap gate on the manifold outlet.
- ◆ Approximately 30-foot long vinyl sheet pile barrier. Sheet pile barrier to have timber cap and walkway to access intake facility and drain gate.
- ◆ One 36-inch diameter slide gate, manually operated, mounted on land side of barrier with flap gate on water side.
- ◆ Electronic controls and monitoring equipment.
- ◆ One 16' x 16' pressure-treated timber screen laydown pad.
- ◆ Bumper/debris boom support piles, pressure treated timber.



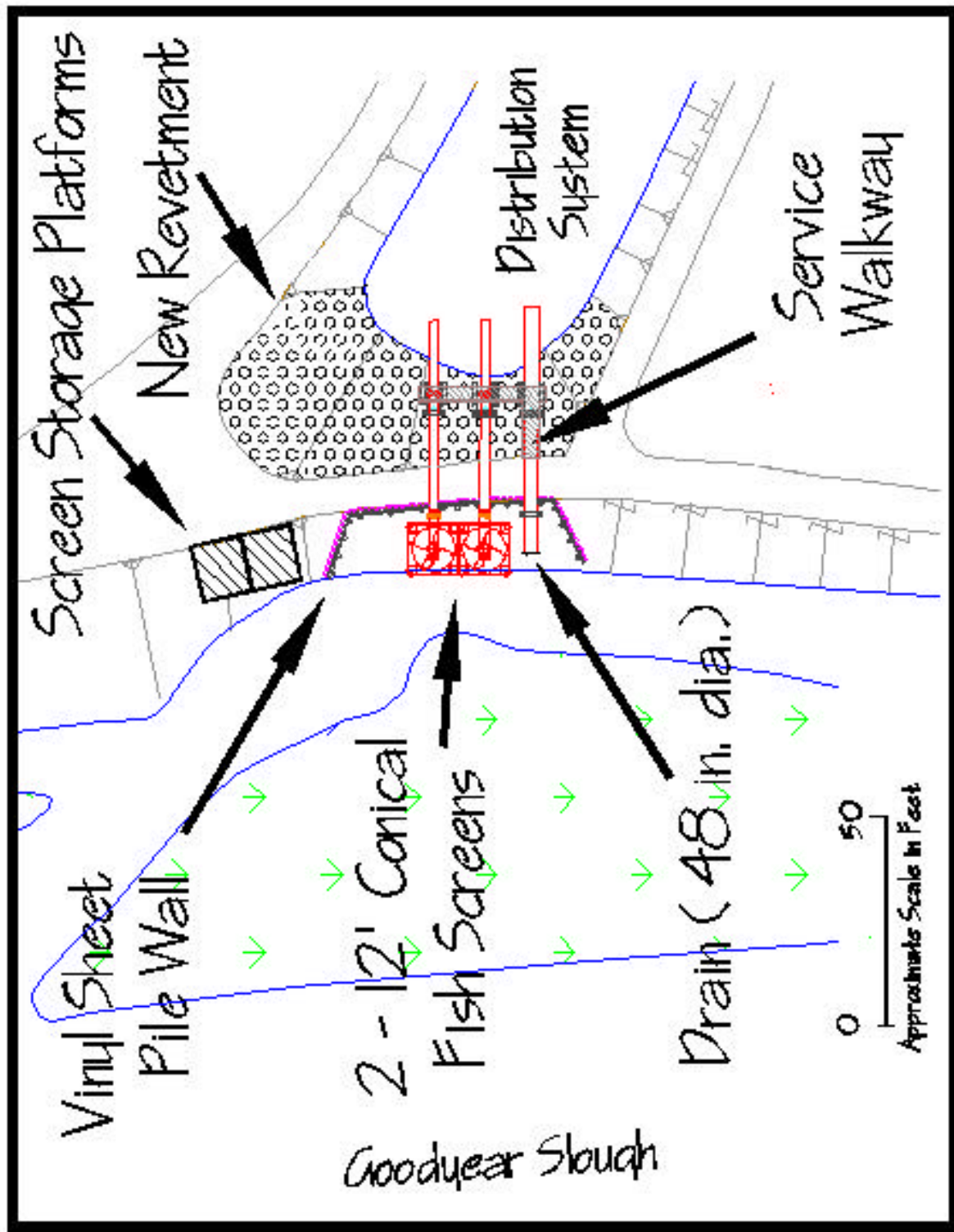


Figure 4. MIDS Intake Fish Screen Structure

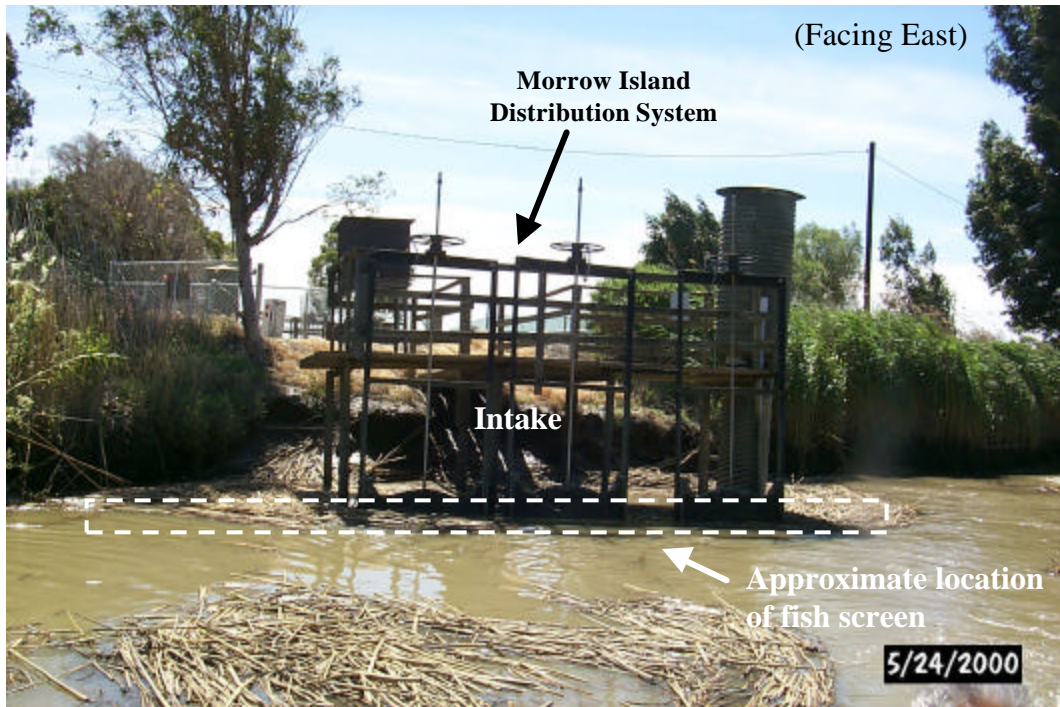


Figure 5 MIDS Existing Intake Facility

**Not to Scale**  
(depicted locations are approximate)



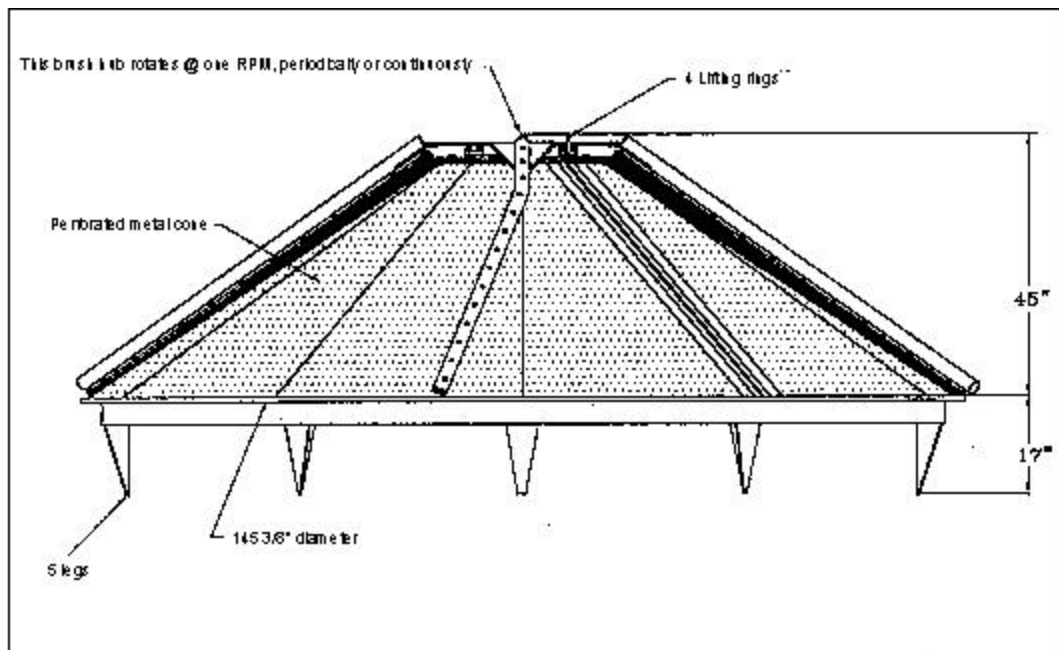


Figure 6. Diagram of conical fish screen and example of a screen installed

### 3.1.2 Installation of Fish Screens on MIDS Intake

The fish screens are anticipated to be installed at the MIDS intake between May 1, 2001 and October 1, 2001. Installation efforts will generally follow the procedures listed below:

- ◆ Construction will begin with demolition and removal of the existing intake facility. A coffer dam will be installed along the bank of Goodyear Slough and water levels within the MIDS will be lowered as much as possible prior to demolition and removal operations. The existing culverts will likely be excavated and removed in stages from the levee in which they are presently encased. Sections of sheet piling may be used temporarily within, or adjacent to, the excavations to maintain slopes and/or prevent or restrict the movement of water.
- ◆ Two 30- to 36-inch diameter screen discharge culverts and one 48-inch drain culvert will be installed in the levee after removal of the existing culverts. The new culverts may be installed within the excavations created from the removal of the existing culverts, or, they may be placed in separate excavations.
- ◆ The new culverts will likely be constructed of a polymer material such as high-density polyethylene (HDPE). The culverts will probably be fitted with flow control valves prior to placement in the excavations. The excavations in which the new culverts are placed, and any excavations remaining from the removal of the preexisting culverts, will be backfilled and compacted so as to reestablish the structural and hydraulic integrity of the levee.
- ◆ A headwall, approximately sixty feet in length, will be constructed along the western edge of the gravel roadway that crosses the current intake structure. Wingwalls will be constructed at both ends of the headwall for slope transition. Up to about 500-cubic yards of bank material will be removed between the wall and Goodyear Slough to provide room for the installation of the fishscreens. Additional room is needed in the slough for boats to pass the screen facility.
- ◆ The headwall will be constructed using sheetpiling. The wall will be reinforced using steel or treated wood pilings driven in along the waterside of the headwall. Headwall construction efforts may require the use of an impact or vibratory pile driver.
- ◆ Fish screen installation efforts will begin with the installation of six steel or treated wood pilings. The pilings are needed for supporting the fish screens in Goodyear Slough. Two 12-foot diameter stainless-steel or copper-nickel fish screens will then be connected to the discharge culverts and secured to the piling set.
- ◆ Revetment will be placed along the levee on the interior side of the intake structure to prevent erosion (Figures 4 and 7).



Figure 7 MIDS Revetment installation at intake facility

**Not to Scale**  
(depicted locations are approximate)

- ◆ Final construction efforts at the MIDS intake will likely consist of the installation of walkways, screen/valve controls, and electrical hookups; and construction of screen laydown platforms. The laydown platforms will be located just off the western edge of Morrow Island Road immediately north of the intake facility. Minor regrading of the upper surface of the MIDS levees may be required to restore road conditions and levee crown elevations to their former specifications.

Material excavated during construction operations will be stockpiled on the crown of the MIDS levee a short distance from the intake site. Any surplus material will be properly disposed of at an off-site location.

### 3.1.3 Fish Screen Laydown Platform Installation

A laydown platform will be installed for each fish screen to allow the screens to be removed from the slough for annual maintenance. The platforms for the intake screens will be located approximately 20 feet north of the proposed intake structure along the levee road. Each platform will be approximately 16-foot square and elevated about 2 feet off the ground. Four wood pilings or pre-cast concrete piers will be used at each platform site. The platforms will be constructed on site and placed on the pilings.

### 3.1.4 Disposal of Dredged Material

In order to allow adequate flow from Goodyear Slough to reach the fish screens, a relatively small amount of material may be dredged at the intake location. It is anticipated that no more than about 300 cubic yards of material will be dredged. All excavated material will be properly disposed of at a site away from the marsh.

## 3.2 Installation of New Turnouts/Drains Along the System

Two new turnouts will be installed along the MIDS (Figure 1). One 36-inch turnout will be installed along the MIDS C-line on Mulberry Land Company (Site MB-3) (Figure 8). This will allow Mulberry's Pond C to be filled directly from the MIDS. A second 36-inch combination turnout and drain will be placed on along M-line to serve the Friendly Godfather property (Site FG-1) (Figure 9).

Both turnouts will be constructed using 36-inch HPDE culverts. The Mulberry (MB-1) culvert will be fitted with a flap gate on the Mulberry end and a slide gate on the MIDS end. The Friendly Godfather (FG-1) culvert will be fitted with combination liftgate/flapgate valves on both ends to allow the culvert to be used for either filling or draining.

Installation efforts will start when the water level in the MIDS is at a minimum and adjoining properties have been adequately drained. Trenches will be excavated through the levee of the MIDS to allow placement of the new culverts. Material excavated from the levee will be stockpiled temporarily on the crown of the MIDS levee system a reasonable distance from the excavations. The material will be placed back into the excavations and compacted after the



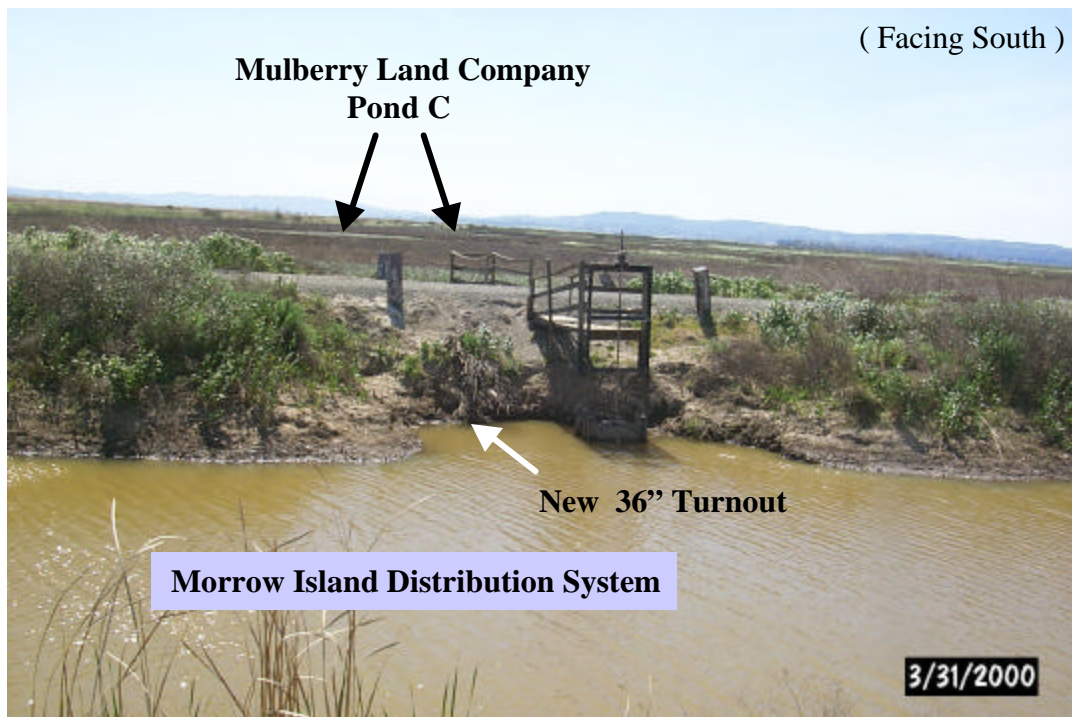
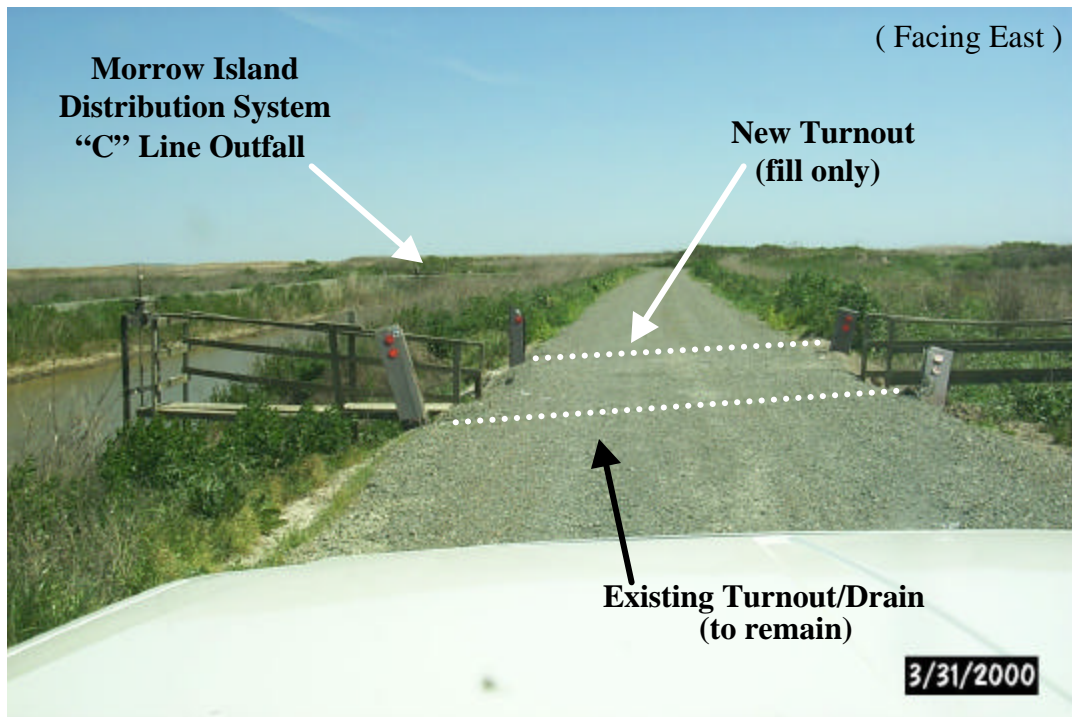


Figure 8 Turnout installation site

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(depicted locations are approximate)

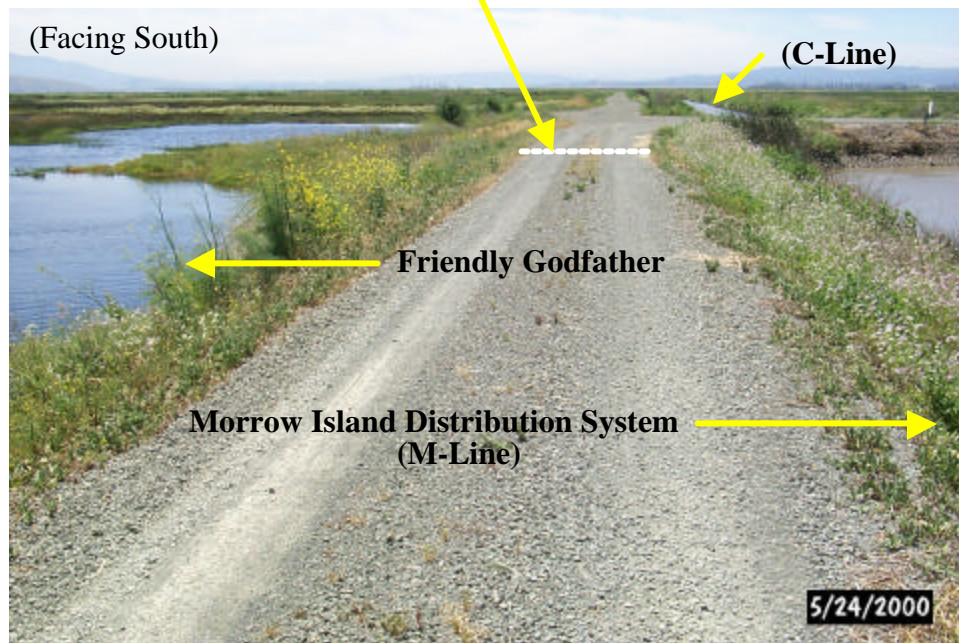
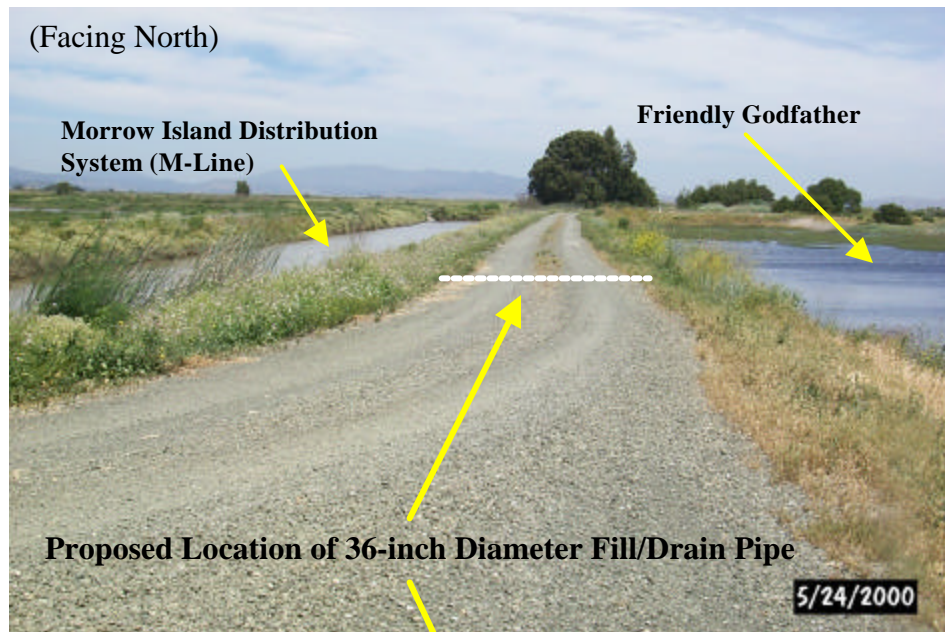


Figure 9 Site FG-1

**Not to Scale**  
 (depicted locations are approximate)



culverts and associated valves have been installed. Excess material will be properly disposed of at a site away from the marsh.

Final installation efforts at both sites will consist of the installation of service walkways on both ends of each culvert. Some minor regrading of the levee crown may be required to restore the road surface and crown elevation.

### **3.3 Additional Construction Information**

The contractor's staging area will be located on Morrow Island Road adjacent to the intake facility. All equipment will be restricted to the levee areas only and will be restricted from any wetlands areas.

It will be a requirement for all construction equipment operated at the site to be free of oil leaks and clean from exposed surface oil. The on-site project monitoring staff will check for adherence to this requirement. If an oil leak should occur, that equipment will be immediately removed from the project site. Required oil spill clean-up equipment will be maintained on site while work is in progress.

### **3.4 MIDS Operations Agreement**

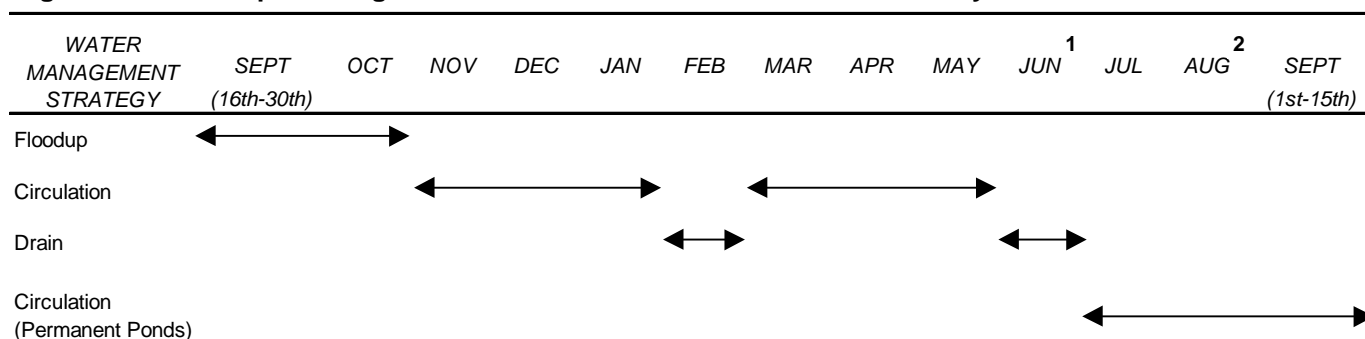
As part of the "Hybrid Proposal" a new joint-operations agreement for the MIDS will be approved by DWR and the MIDS-serviced landowners. This agreement will allow the landowners to flood and drain using the MIDS, following the wetland management operation procedures recommended in their Individual Ownership Management Plans.

#### **3.4.1 DWR Operation of the MIDS**

An illustration of the proposed operations schedule is shown in Figure 10. The settings for the MIDS intakes and drains for each water management strategy are shown in Table 1. DWR will be responsible for operating the MIDS facility according to the schedule and settings show in Figure 10 and Table 1.

#### **3.4.2 Landowner Diversion Plan for MIDS**

An objective of the "hybrid proposal" is to distribute the existing MIDS diversion capacity among the MIDS intake and the five conical fish screens. Figure 11 shows the proposed diversion plan for the three clubs. Friendly Godfather will flood entirely from the MIDS through one 36-inch culvert. Mulberry Land company will flood Pond C from the MIDS through 36-inch culvert, and Morrow Island Club will flood and drain Ponds E and F from the MIDS with two 48-inch culverts. The remaining culverts on the MIDS will be used as drain only. The MIDS intake will provide a total flow of about 52 cfs. To provide an equal amount of water to each club, DWR has calculated liftgate settings based on pipe diameter (Table 2). Figure 11 shows the approximate flooded acreage and percent flow for each club based on the proposed liftgate settings. Individual landowners will be responsible for maintaining the liftgate settings.

**Figure 10 Annual operation guidelines for the Morrow Island Distribution System**

1. During the month of June the screens will be removed for cleaning and maintenance.

2. During the month of August the MIDS will be operated to flush out sediments from the MIDS.

**Table 1 MIDS Facility Gate Settings**

WATER MANAGEMENT STRATEGY	MIDS OPERATION	2 INTAKE CONICALS	GOODYEAR DRAIN	M-LINE DRAIN	C-LINE DRAIN
Floodup	Full Fill / No Drain	Open Full	Closed	Closed	Closed
Circulation	Full Fill / Partial Drain <sup>1</sup>	Open Full	Open Partial	Open Partial	Open Partial
Drain	No Fill / Full Drain	Closed	Open Full	Open Full	Open Full
Circulation (Permanent Ponds)	Full Fill / Full Drain	Open Full	Open Full	Open Full	Open Full

1. Maintain ditch water level between 4-5 feet NGVD with maximum circulation. Use monitoring to determine drain gate setting.

**Table 2 Approximate liftgate settings to maintain flow through fill pipes (all settings in inches)**

48" Diameter Pipes		36" Diameter Pipes	
Head Difference (Ditch to Pond)	Open each liftgate	Head Difference (Ditch to Pond)	Open each liftgate
6	19	6	22
12	16	12	18
18	15	18	16
Greater than 24	14	Greater than 24	15

### 3.5 MIDS Operations and Maintenance

DWR will be responsible for operating and maintaining the MIDS. Operation schedule will follow the guidelines contained in Section 3.4, or the most recent approved version thereof. Individual landowners will be responsible for operations and maintenance of diversions along the MIDS.

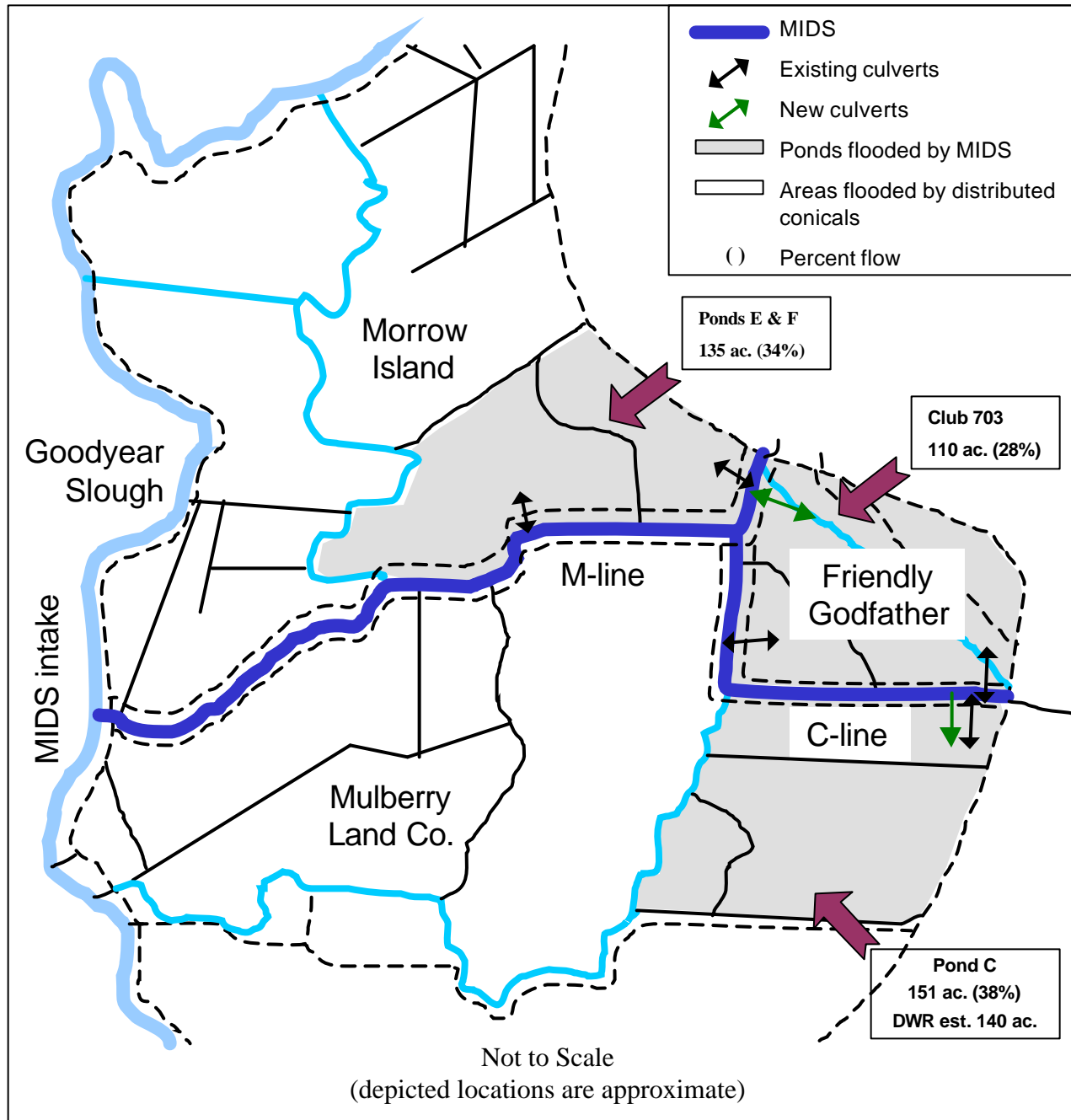


Figure 11 Proposed diversion plan

#### **4.0 PROJECT DESCRIPTION FOR SRCD ACTIVITIES ON INDIVIDUAL OWNERSHIPS**

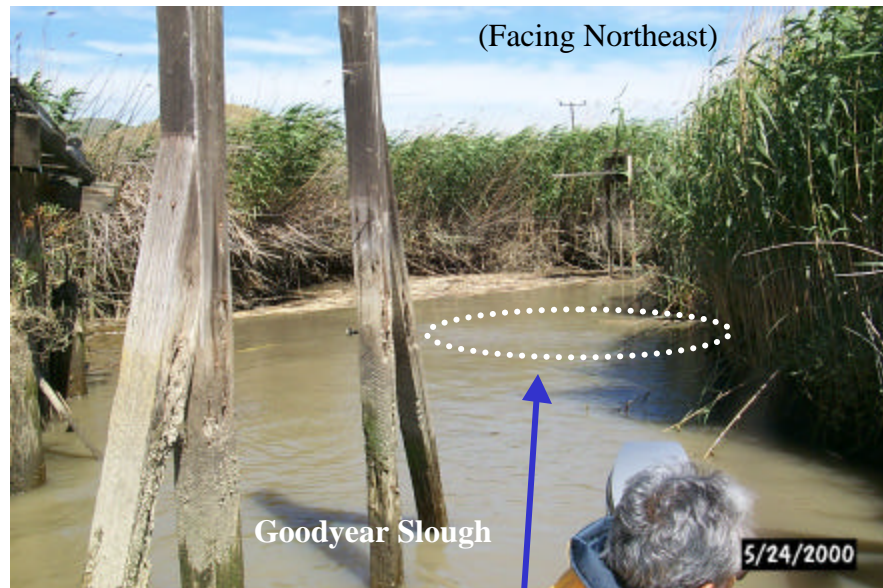
Under contract with DWR, SRCD will install five 12-foot conical fish screens on the three individual ownerships serviced by the MIDS (Figures 12 through 17). Four screens will be placed in Goodyear Slough, two for the Mulberry Land Company (Sites MB-1 and MB-2), and two for the Morrow Island Company (Sites MI-1 and MI-2). One additional screen will be placed in Suisun Slough for the Morrow Island Company (Site MI-3). These screens will allow the individual ownerships to draw water directly from Goodyear and Suisun Sloughs in lieu of using the MIDS. Construction is anticipated to begin April 1, 2001 and be completed by October 1, 2001.

#### **4.1 Fish Screens**

##### **4.1.1 Installation of Fish Screens**

The screen design and installation procedure will be similar to that outlined in Section 3.1. However, any existing culverts at the fish screen installation sites will be left in-place to allow supplemental flooding (Discussed in Section 4.2). Installation procedures at each site will generally follow the steps listed below.

- ◆ A coffer dam will be installed in the slough at the installation site.
- ◆ A trench will be excavated for the culvert. Excavated material will be stockpiled along the levee and later used to backfill the culvert.
- ◆ One 30- to 36-inch diameter screen discharge culvert will be installed in the levee. The new culvert will likely be constructed of a polymer material such as high-density polyethylene (HDPE). The culverts will probably be fitted with flow control valves prior to placement in the excavations. The excavations in which the new culverts are placed will be backfilled and compacted so as to reestablish the structural and hydraulic integrity of the levee.



**Proposed Location of  
Fish Screen**

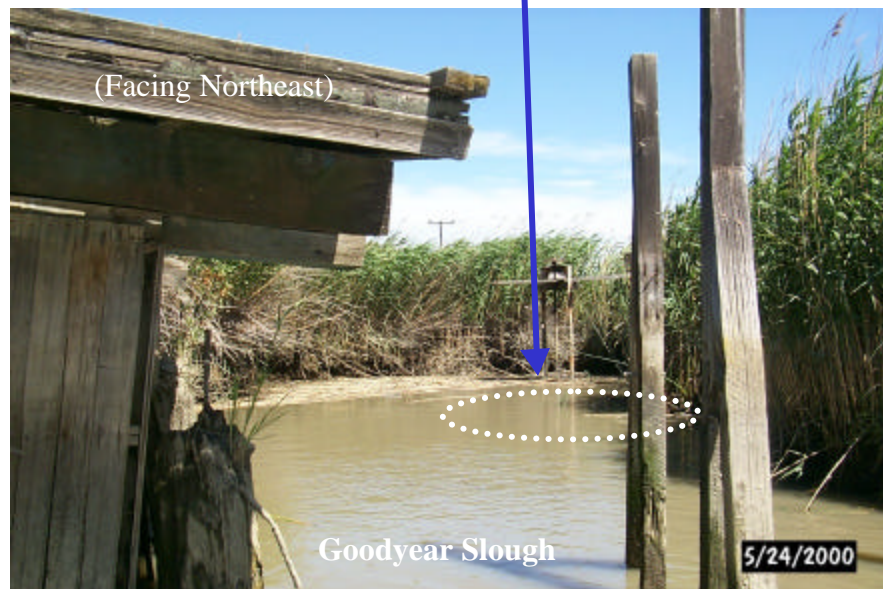


Figure 12 Site MB-1, Goodyear Slough Side

**Not to Scale**  
(depicted locations are approximate)

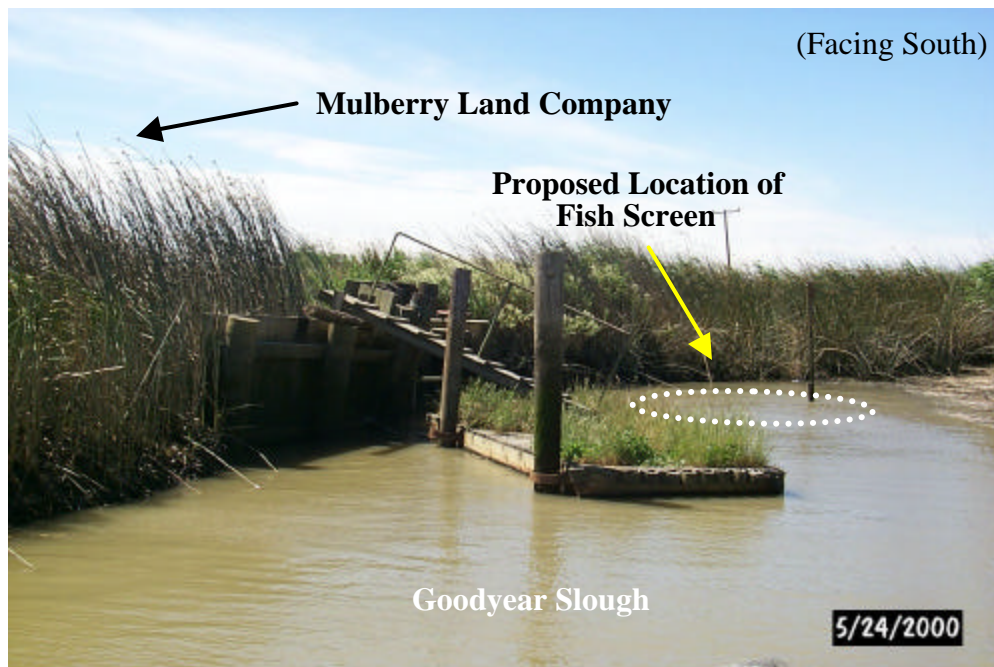


Figure 13 Site MB-2, Goodyear Slough Side

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 (depicted locations are approximate)



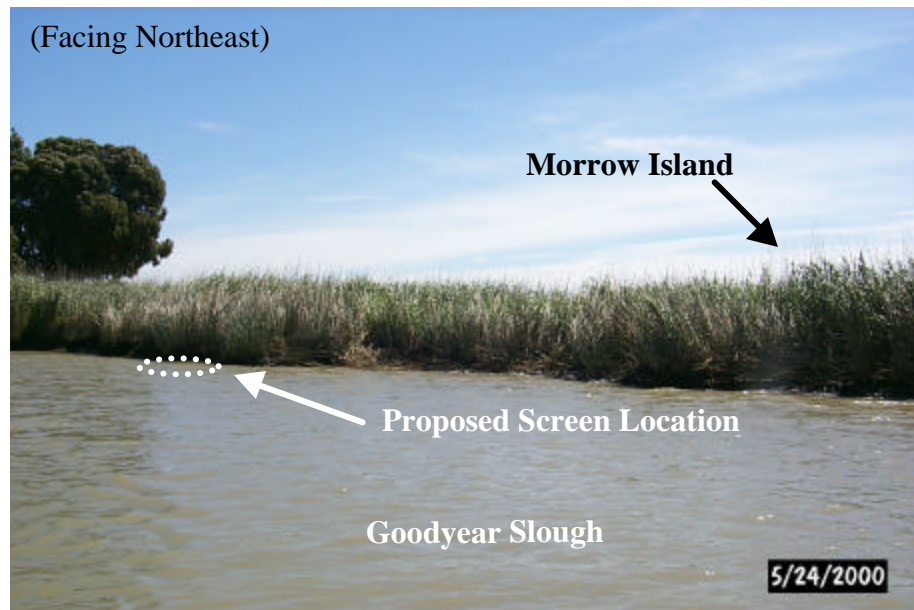


Figure 14 Site MI-1, Goodyear Slough Side

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(Depicted location is approximate)

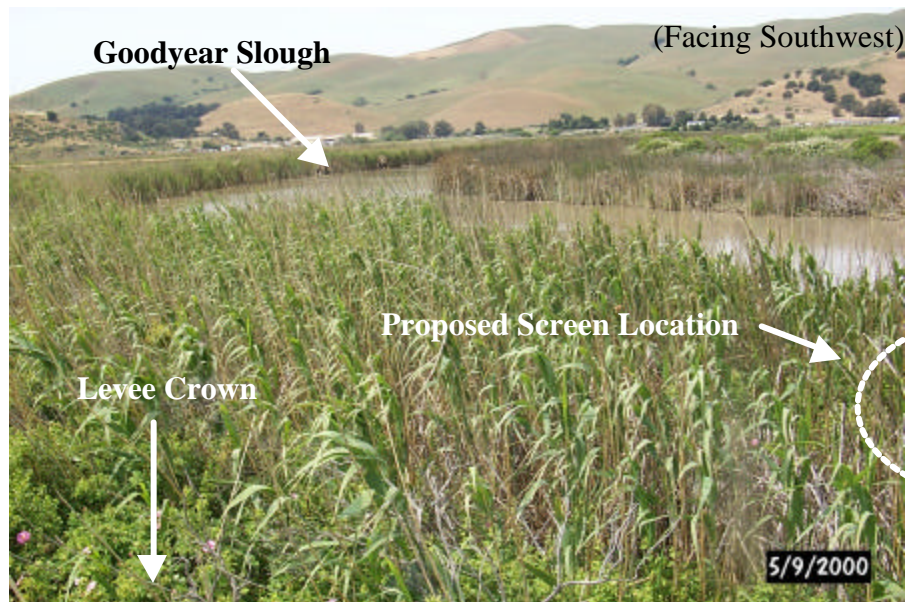
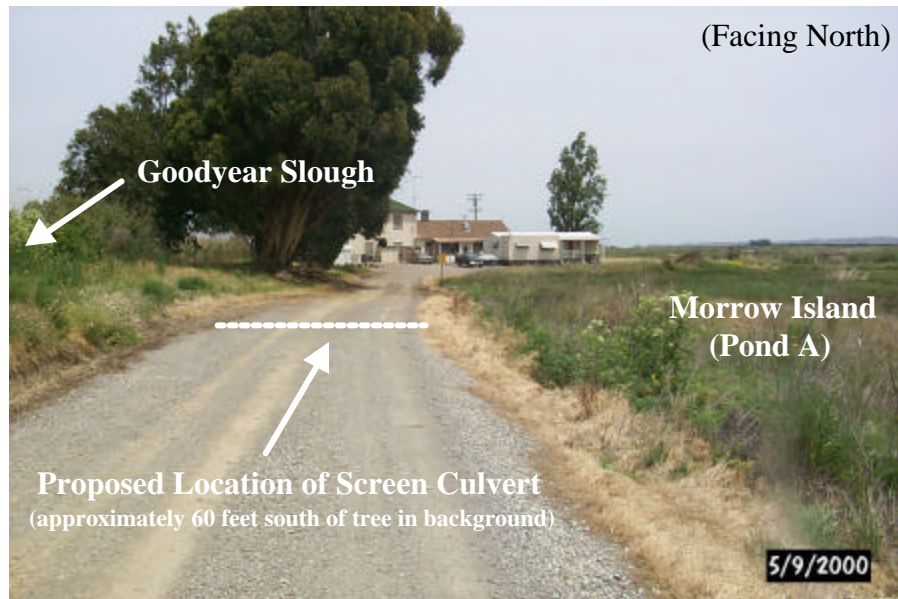


Figure 15 Site MI-1, Inland

**Not to Scale**  
(depicted locations are approximate)



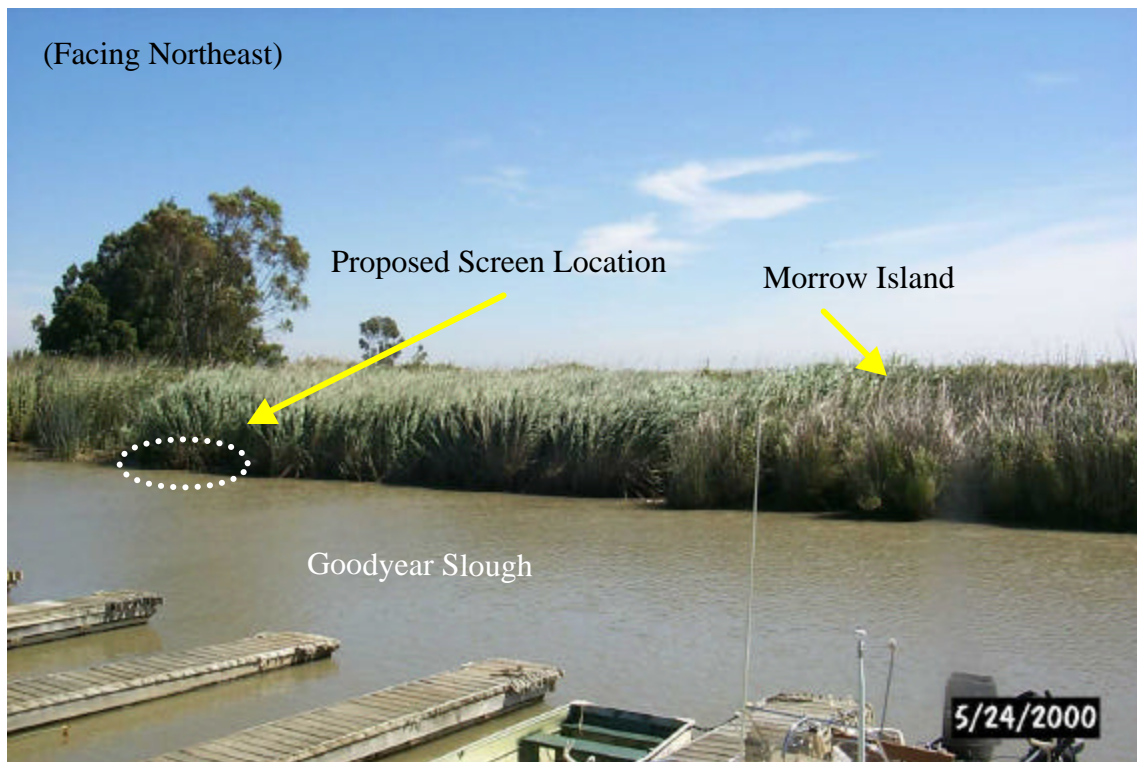


Figure 16 Site MI-2

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(depicted locations are approximate)

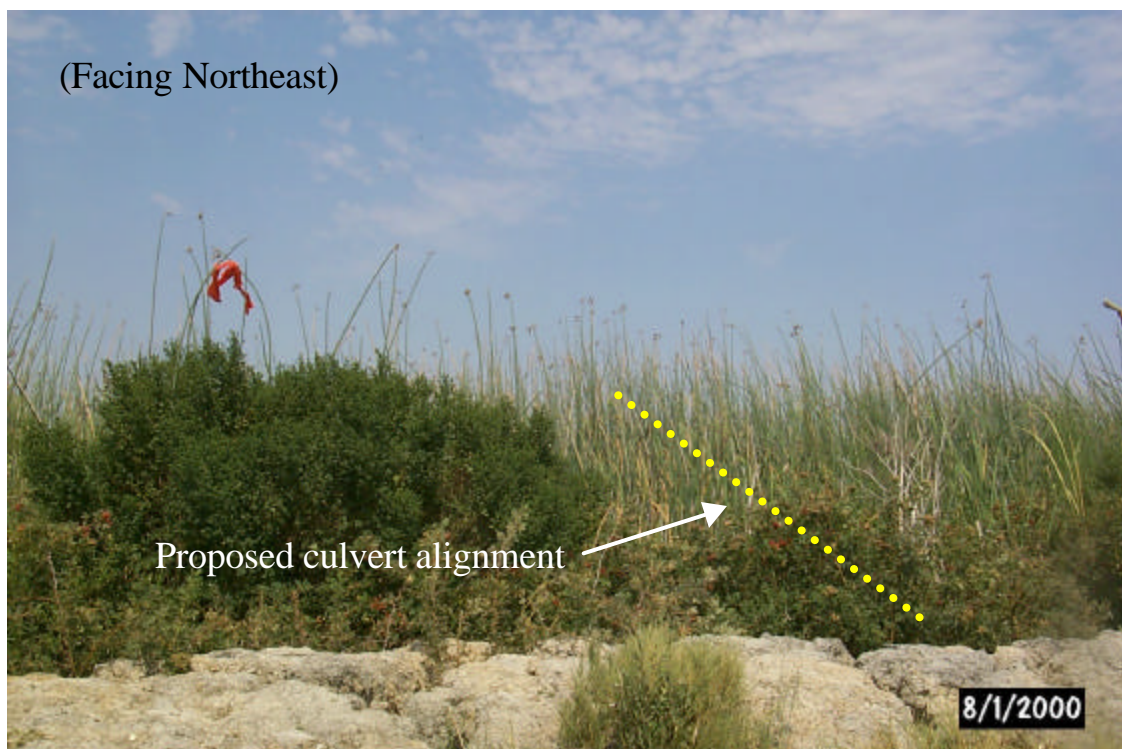
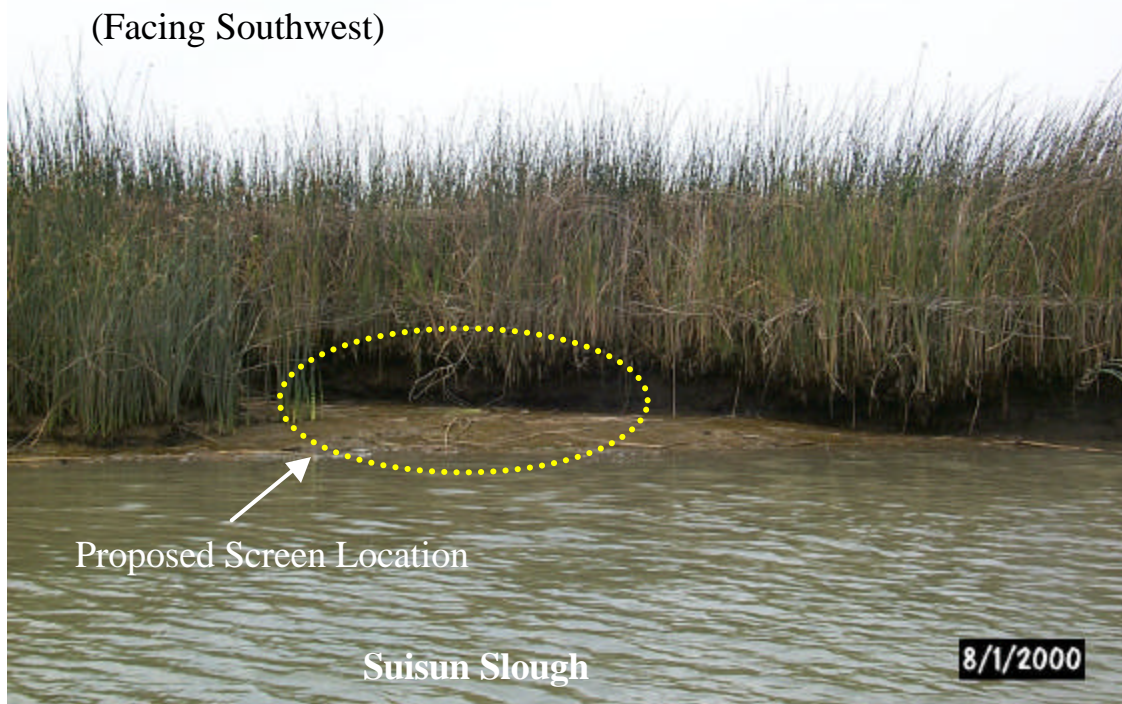


Figure 17 Site MI-3

**Not to Scale**  
(depicted locations are approximate)



- ◆ A headwall, approximately 20 feet in length, will be constructed along the levee. Wingwalls will be constructed at both ends of the headwall for slope transition. Up to about 100-cubic yards of bank material will be removed between the wall and slough to provide room for the installation of the fishscreens.
- ◆ The headwall will be constructed using sheetpiling. The wall will be reinforced using steel or treated wood pilings driven in along the waterside of the headwall. Headwall construction efforts will likely include the use of an impact or vibratory pile driver.
- ◆ Fish screen installation efforts will begin with the installation of four steel or treated wood pilings. The pilings are needed for supporting the fish screens. The 12-foot diameter stainless steel or copper-nickel fish screen will then be connected to the discharge culverts and secured to the piling set.
- ◆ Final construction efforts will likely consist of the installation of walkways, screen/valve controls, and electrical hookups; construction of screen storage platforms; and, any necessary regarding of the levee and adjoining roadway to restore them to preexisting specifications.

#### 4.1.2 Fish Screen Platform Installation

Maintenance platforms will be installed for each site. The platform installation procedure will follow that described in Section 3.1.

#### 4.1.3 Fish Screen Operation

The individual owners will use the MIDS and the screened diversions as the first fill option. In the event that sufficient fill capacity is not obtained with the screened diversions, owners will use existing unscreened diversions to supplement. Unscreened diversions will not be used during periods of mandatory endangered species intake closures.

#### 4.1.4 Fish Screen Maintenance

Individual owners will be responsible for operation activities on the fish screens placed on their property. DWR will provide for screen maintenance through a contract with SRCD, or directly through a private contractor.

### 4.2 Junction Box Installation

A flow control structure will be installed at the MI-3 site to allow the landowner to control water flow between ponds J and F (Figure 18). The structure will be installed in the existing toe ditch on the interior side of the levee. The structure will consist of two berms on either side of the intake culvert. Each berm will have a 36-inch diameter culvert with a slide gate on the interior (control structure) side.

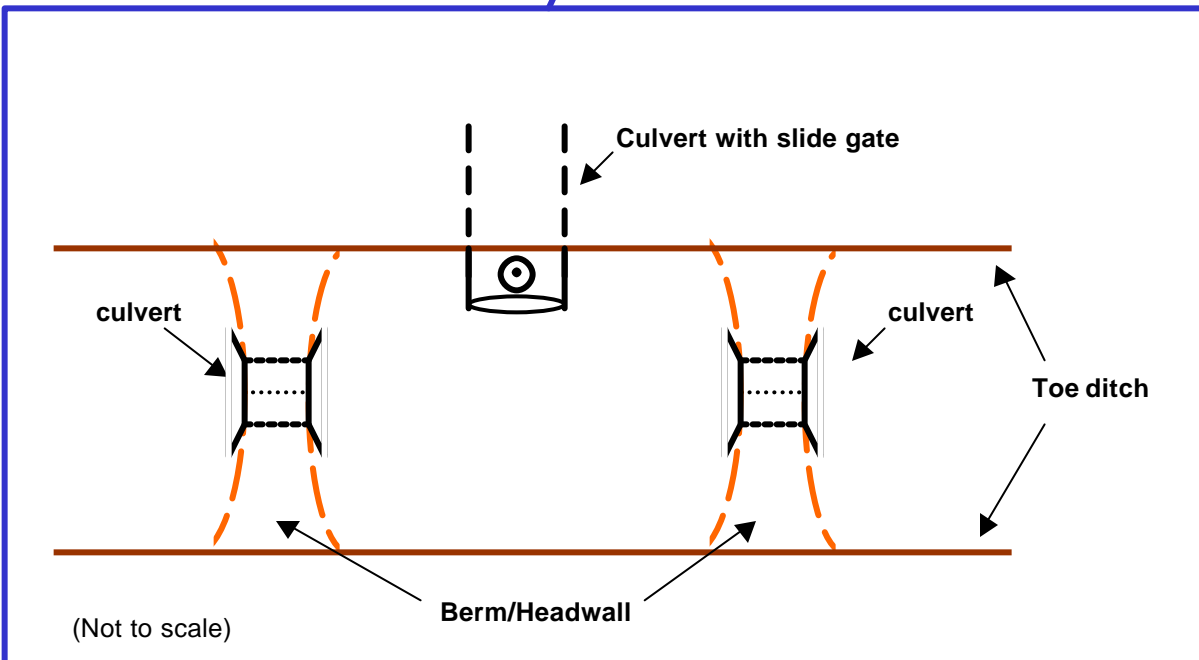


Figure 18 Site MI-3 Flow Control Structure

## 5.0 ALTERNATIVE ANALYSIS

### 5.1 Development of Hybrid Proposal

The proposed project consists of a combination of fish screens on the MIDS and fish screens on individual ownerships. The original USFWS Biological Opinion for the MIDS maintenance included the following Terms and Conditions:

“...the Department of Water Resources shall install a screen on the Goodyear Slough diversion structure... The screen shall be either a 3/32-inch profile bar screen or a 5/32 inch perforated mesh plate...”.

In October 1999, DWR and USFWS met to discuss alternatives to building a large fish screen structure on the MIDS intake. The goal was to develop an alternative that would provide equivalent fisheries protection, but would avoid significant disturbance to the environment as well as allow the MIDS to operate effectively. Between October 1999 and May 2000, DWR worked cooperatively with DFG, USBR, SRCD, USFWS, and Morrow Island landowners to develop and evaluate several alternatives. Seven fish screen alternatives were developed and are listed below. The alternatives were evaluated with respect to twelve evaluation criteria (Table 3).

#### Fish Screen Alternatives for the MIDS

##### 1. Screens at the MIDS Intake

*Option 1 – Inclined Plate Screen*

*Option 2 – Conical Screens*

##### 2. Smaller Screen Facilities with Pumping at the MIDS Intake

*Option 1 – Use of Electric Pumps at the MIDS Intake with Inclined Plate Screen*

*Option 2 – Use of Electric Pumps at the MIDS Intake with Conical Screens*

##### 3. Operation of the MIDS as Open Ditch System

*Option 1 – Allow free movement of water through culverts*

*Option 2 – Open up the ends of the MIDS*

*Upgrade interior levee system to exterior levee specification*

*Provide distributed screens*

##### 4. Ground-Water Development

##### 5. Land Purchase from Willing Sellers

##### 6. Operation of the MIDS as a Drain-Only System

*Option 1 – Mobile Screens and Pumps*

*Option 2 – Distributed Conical Screens*

























































































##### 7. “Hybrid Proposal”

*2 Conical screens and 1 drain at MIDS Intake*

*2 Additional turnouts – Clubs 703 and 705*






*5 Distributed Conical Screens – Clubs 702 and 705*

**Table 3 Comparison of "Fish Friendly" alternatives for the Morrow Island Distribution System**

ALTERNATIVE EVALUATION CRITERIA	SCREENS AT THE MIDS INTAKE		SMALLER SCREEN FACILITY AT THE MIDS INTAKE USING PUMPS		OPERATION OF THE MIDS AS AN OPEN SYSTEM (WITH DISTRIBUTED SCREENS)		GROUND WATER DEVELOPMENT <sup>1</sup>	LAND PURCHASE <sup>2</sup>	OPERATION OF THE MIDS AS A DRAIN-ONLY SYSTEM		CONICAL SCREENS AT THE MIDS INTAKE AND DISTRIBUTED SCREENS "HYBRID PROPOSAL"
	INCLINED PLATE SCREEN	CONICAL SCREENS	INCLINED PLATE SCREEN	CONICAL SCREEN	OPEN CULVERTS	OPEN ENDS			MOBILE SCREENS AND PUMPS	DISTRIBUTED CONICAL SCREENS	
ACCEPTABILITY TO LAND OWNER(S)							N o t	N o t	N o t		
WATER QUALITY											
ENVIRONMENTAL IMPACT											
PERMITTING REQUIREMENTS											
TIME REQUIRED TO IMPLEMENT							F	F	F		
MANAGED WETLAND OPERATIONAL FLEXIBILITY							e	e	e		
REDEPLOYMENT/ SALVAGE POTENTIAL							a	a	a		
REDUCTION OF SYSTEM SEDIMENTATION							s	s	s		
OPERATIONS AND MAINTENANCE							i	i	i		
CONSISTENCY WITH AMENDMENT III							b	b	b		
PROCUREMENT REQUIREMENTS							l	l	l		
APPROXIMATE COST (MILLIONS)	\$2.2	\$2.6	\$2.1	\$2.3	\$4.6	\$5.5	e	e	e	\$2.1	\$2.5

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## KEY

	THIS RATING IS ASSIGNED WHEN RELATIVELY MINOR PROBLEMS/DIFFICULTIES OR NO PROBLEMS/DIFFICULTIES ARE EXPECTED TO EXIST WITH AN ALTERNATIVE IN RELATION TO THE GIVEN EVALUATION CRITERIA.		THIS RATING IS ASSIGNED WHEN SMALL PROBLEMS/DIFFICULTIES ARE EXPECTED TO EXIST WITH AN ALTERNATIVE IN RELATION TO THE GIVEN EVALUATION CRITERIA.		THIS RATING IS ASSIGNED WHEN MODERATE PROBLEMS/DIFFICULTIES ARE EXPECTED TO EXIST WITH AN ALTERNATIVE IN RELATION TO THE GIVEN EVALUATION CRITERIA.		THIS RATING IS ASSIGNED WHEN SIGNIFICANT PROBLEMS OR DIFFICULTIES ARE EXPECTED TO EXIST WITH AN ALTERNATIVE IN RELATION TO THE GIVEN EVALUATION CRITERIA.		THIS RATING IS ASSIGNED WHEN VERY SIGNIFICANT OR POSSIBLY INSURMOUNTABLE PROBLEMS OR DIFFICULTIES ARE EXPECTED TO EXIST WITH AN ALTERNATIVE IN RELATION TO THE GIVEN EVALUATION CRITERIA.
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## FOOTNOTES:

1. Not feasible because ground-water development potential is unknown at this time. Preliminary evaluation efforts indicate that ground-water production is not a viable alternative.
2. Not feasible at this time. No willing sellers of land have been identified.
3. Not feasible at this time. No commercially-available portable fish screens with a proven performance record were identified.

Three of the suggested alternatives – ground water development, land purchase, and operation of the MIDS as a drain-only system – were determined not feasible at this time. Three other alternatives – screens at the MIDS intake, small screen facility at the MIDS intake using pumps, and operation of the MIDS as an open system with distributed screens – were found to have very significant or possibly insurmountable problems. The “Hybrid Proposal” was determined to have the least problems and/or difficulties with respect to the evaluation criteria and is considered the preferred alternative. The preferred alternative consists of the installation of seven conical fish screens, two turnouts on the MIDS, and a revised operations agreement for the MIDS.

A primary objective of the “hybrid proposal” is to distribute the existing MIDS diversion capacity among the MIDS intake and the five conical fish screens. Distribution of the existing diversion capacity between the MIDS intake and five fish screens will reduce the volume of water diverted at the MIDS intake. Figure 11 shows the proposed diversion strategy for the three clubs serviced by the MIDS. Reduction in the diversion volume at the MIDS intake will likely reduce fish entrainment at the MIDS intake screens.

## 5.2 Site Selection

Site locations were selected to meet the following criteria: (1) provide optimum fill/drain capacity for landowners; and (2) result in minimal environmental impact. If possible, sites were selected at existing (MB-1 and MB-2) or historical (MI-2 and MI-2) culvert locations, where vegetation disturbance would be minimal. Two potential locations were originally identified for site MI-3 (Figure 19). Location A is located at the site of an existing water quality monitoring station. This location was identified because of its proximity to the monitoring station and the associated human disturbance already occurring in this area. The screen would be located on the edge of the tidal fringe with a culvert running under the levee back to the toe ditch. Location B is located about 400 feet south of the monitoring station, at a relatively narrow band of tidal fringe. This location was identified during aerial surveys as a potential site because of the narrow band of tidal fringe along that levee section. The two locations were ranked relative to each other based on the criteria in Table 4. A rank of 1 indicates that the location is preferred with respect to the given criterion. As can be seen in Table 4, Location B is the preferred site for five of the six criteria, and was therefore chosen as the MI-3 site. Although there is not current human disturbance at the selected site, it is anticipated that disturbance due to operations and maintenance of the site will be minimal.

Table 4 Selection criteria and ranking for two MI-3 site locations

Criteria	Location A	Location B
Current level of human disturbance	1	2
Area of wetland vegetation disturbed	2	1
Amount of dredging required	2	1
Construction	2	1
Operations and maintenance	2	1
Permitting requirements	2	1

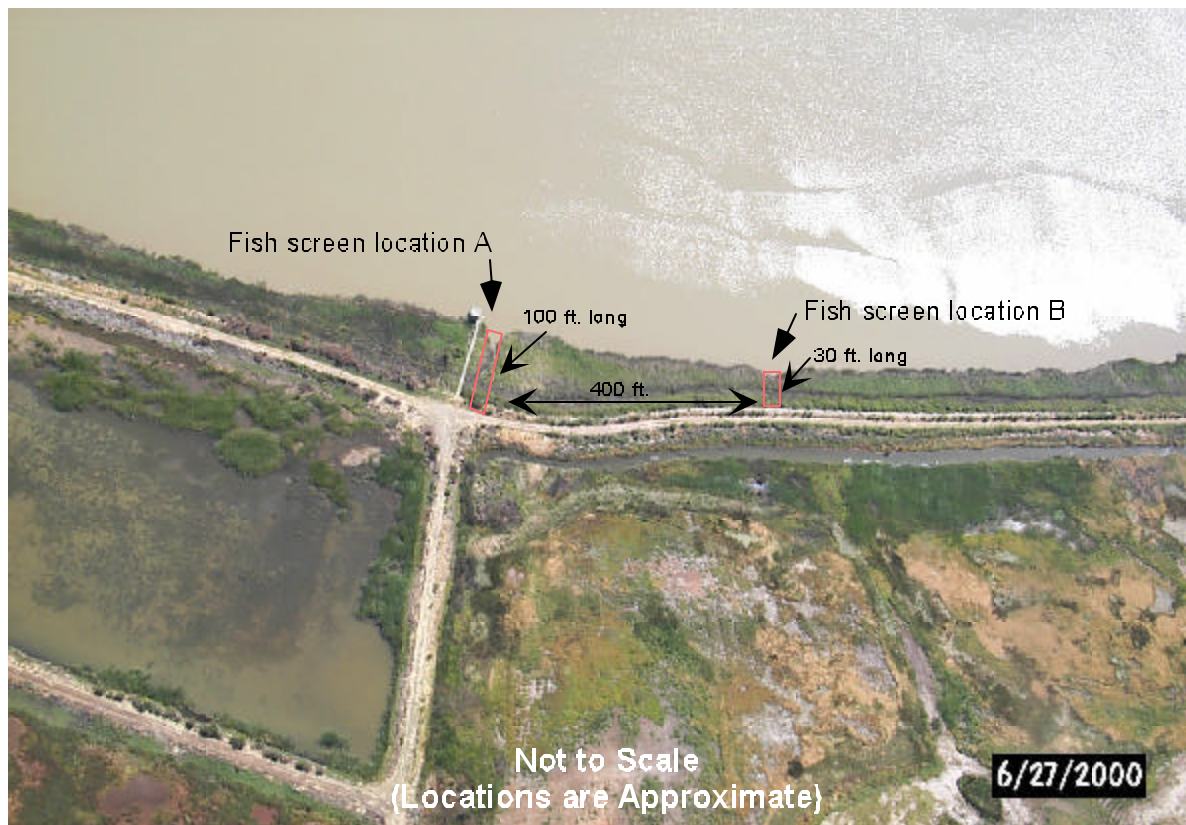


Figure 18 Site MI-3 optional fish screen locations



## 6.0 IMPACTS ANALYSIS

### 6.1 Loss of Wetlands

The installation of the seven fish screens will have less than significant impacts on both wetlands and sensitive species. For wetlands, there will be a permanent loss of less than a 0.10 acres, and an additional area of less than 0.10 acres of temporarily disturbed wetlands. The wetland acreage estimated to be lost and disturbed is shown in Table 5.

**Table 5 Estimated wetland vegetation impacts**

<i>Site</i>	<i>Wetland Vegetation Impacts</i>
MI-1	400 sq ft permanent loss, 400 sq ft temporary disturbance
MI-2	no net loss of wetland, nominal amount disturbed
MI-3	400 sq ft permanent loss, 400 sq ft temporary disturbance
MB-1	400 sq ft permanent loss, 400 sq ft temporary disturbance
MB-2	nominal amount lost, nominal amount temporary disturbance
MB-3	nominal amount lost or disturbed
FG-1	nominal amount lost or disturbed
MIDS Intake	1500 sq ft permanently lost, 1000 sq ft temporarily disturbed

For MI-1 and MI-2, the loss of wetland habitat will result from the construction of inlets for the installation of the screens. The construction of MI-2 will result in little wetland lost as the installation of the screen will be in an upland peninsula, which was created when an early culvert was installed. The installation of MI-3 will result in no net loss of wetland, as the screen will be installed in Suisun Slough channel, connected by a pipe buried in an inlet that currently exists at the site.

MB-1 and MB-2 will be installed at locations where culverts already exist. The loss of wetland habitat at those sites will be minimal and less than significant.

MB-3 and FG-1 will be placed in interior levees. A minimal amount of wetland habitat will be temporarily disturbed.

The installation of the MIDS Intake screens will result in the largest disturbance, but within an area of substantial human disturbance, and the minimal amount of additional wetland habitat lost will be less than significant.

### 6.2 Sensitive Species Impacts

#### 6.2.1 California Clapper Rail

The Clapper Rail is the species of primary concern relative to project activities. It may be potentially impacted in two ways: through the loss of nesting/foraging habitat, and through

mechanical and human disturbance of nesting birds.

Clapper rails are not known along Goodyear Slough, so the potential to impact the species during the installation of screens MI-1 and MI-2, MB-1 and MB-2, and the MIDS Intake will be minimal. Pre-construction surveys (passive; active if no response) will be conducted in Spring 2001, and no construction will be allowed within 400 meters of an identified territory within the clapper rail nesting window. The loss of emergent wetland will be minimal, and in areas where it occurs in narrow strips and close to substantial human disturbances, so the likelihood that nest sites would be lost due to the installation of the screens is nominal.

Clapper rails have been observed in Suisun Slough emergent wetland, and in close proximity to the MI-3 screen site. Pre-construction surveys (passive; active if no response) will be conducted in Spring 2001, and no construction will be allowed within 400 meters of an identified territory within the clapper rail nesting window. The project will be designed to minimize the potential loss of a nest site and to avoid significantly fragmenting potential habitat by selecting the narrowest section of emergent wetland. Because clapper rails have been observed near site MI-3, this site will be installed last to avoid the nesting season. The potential to significantly impact rails is extremely small at all sites.

#### 6.2.2 Sensitive Plant Species

The sensitive plant species of most concern in the project area are Suisun Marsh aster (*Aster lentus*), delta tule pea (*Lathyrus jepsonii* var. *jepsonii*), and Mason's lilaeopsis (*Lilaeopsis masonii*). A sensitive plant survey was conducted on August 1, 2000. Sensitive plant species or potentially sensitive plant species were found at three sites. At site MI-1 and the MIDS intake (interior side), potential Suisun aster was found. The plant was classified as potential because it could not be identified to species at this time. At site MI-3, delta tule pea was found along the proposed alignment. In spring 2001, prior to finalizing the culvert alignment for sites MI-1 and MI-3, a qualified botanist will conduct a sensitive plant survey. If possible, the alignments will be moved to avoid disturbance of continuous patches of sensitive species. In the event the species cannot be avoided, the appropriate regulatory agencies will be consulted.

#### 6.2.3 Critical Species Habitat

At site MI-1, a continuous pickleweed patch was found on the inside of Pond A along the culvert alignment. Pickleweed itself is not a sensitive plant species, but is critical habitat for the endangered salt marsh harvest mouse (*Reithrodontomys raviventris*). The proposed activities would permanently impact approximately 16 square feet along the inside edge of Pond A. The majority of this impact will be outside of the pickleweed patch. During construction activities, some pickleweed may be temporarily impacted; however, these impacts will be kept to the minimum.

## **7.0 PERMIT REQUIREMENTS**

### **7.1 Permits for DWR Activities on the MIDS**

The Department will obtain the following environmental permits for this project:

- ◆ California Environmental Quality Act Notice of Exemption
- ◆ California Department of Fish and Game Streambed Alteration Agreement
- ◆ USACE Nationwide Permit
- ◆ Regional Water Quality Control Board Water Quality Certification
- ◆ San Francisco Bay Conservation and Development Commission Maintenance Permit

### **7.2 Permits for SRCD Activities on Individual Ownerships**

Activities conducted by SRCD on the Individual Ownerships will be conducted under their USACE Regional General Permit Number 3 for Activities in the Suisun Marsh (No. 24215N). The RGP contains provisions for installation of new water control structures and installation of fish screens on exterior water control structures. All terms and conditions of the RGP will be followed.